



Department
for Environment
Food & Rural Affairs



Llywodraeth Cymru
Welsh Government



Progress with Weed Biocontrol Projects



CABI - UK

January 2020

Cover image: Experimental field-trial assessing a single-mating type isolate of *Mycosphaerella polygoni-cuspidati* against Japanese knotweed at CABI, Egham

Introduction

Since April 2011, Defra in partnership with the Welsh Government and Natural England has been funding specialist scientists to investigate the scope for biological control of invasive, non-native aquatic and riverside weeds. Additional financial support for this research has been provided by the Environment Agency, the Canal & River Trust, private water companies (South West Water, Dŵr Cymru, Yorkshire Water, South Staffs Water), the MoD, and a number of Wildlife Trusts and Local Authorities (* see also footnote for additional funders). Biological control has the potential to play an important role in protecting aquatic and riparian habitats where chemical and mechanical control options are impractical or prove to be prohibitively expensive, thus helping the UK to meet its commitment to the EU Water Framework Directive and towards other legislation and policies, both at a UK government level and within the Devolved Administrations (DA's). This control method is already providing sustained and highly successful management of the invasive exotic water fern *Azolla filiculoides* through *Stenopelmus rufinasus*, a weevil native to the Americas which was introduced into the UK together with the weed.

CABI is targeting **Australian swamp stonecrop** (*Crassula helmsii*), **Himalayan balsam** (*Impatiens glandulifera*) and **floating pennywort** (*Hydrocotyle ranunculoides*), and these projects complement our on-going work on the biocontrol of **Japanese knotweed** (*Fallopia japonica*). CABI is also mass-rearing and supplying the **water fern** weevil at cost, for early season inoculation of infestations of the weed, to ensure ongoing biological control. This is the eleventh in a series of annual summary notes on progress made and covers the time frame to the end of January 2020.

Japanese knotweed (*Fallopia japonica*)



Early releases of the psyllid *Aphalara itadori* (2010-2014) demonstrated safety, but led to limited establishment at isolated sites. From 2015 to 2016 releases were conducted in collaboration with Local Action Groups across England and Wales including at riparian sites under an amended license. Adults were found at all sites with reducing abundance over the season and minimal overwintering survival. In autumn 2016, winter morph adults and newer psyllid stock were released leading to overwintering survival at multiple sites in low numbers. Cultures made up of newer psyllid stock and reared from outdoor overwintered adults were prioritised for release at sites in England and Wales in 2017, however establishment and overwintering were low, with challenging environmental conditions. In conjunction with EU RAPID LIFE, releases of the newer stock were made in England in 2018 using various approaches. Establishment was limited, and overwintering survival observed in the Midlands, SE and SW was minimal. No releases were made in 2019 and population persistence appears very low. A survey to Japan was undertaken in June 2019 to collect psyllids better climatically matched to UK conditions. New cultures are undergoing host range evaluation in quarantine.

The leaf-spot fungus *Mycosphaerella polygoni-cuspidati* is currently under evaluation for use as a mycoherbicide after studies showed that the pathogen could cause restricted disease symptoms on a couple of non-target plant species under quarantine greenhouse conditions, thus not being suitable for classical biocontrol. Such potential mycoherbicide would be based on a single-mating type isolate to prevent the fungus from reproduction, persistence and spread in the field. A granted European patent held in the name of the Secretary of State protects the idea with patent registration being pursued in individual countries. Additional international patent applications are pending. Based on a Pest Risk Assessment (PRA) Defra approved the agent for release from quarantine and CRD-licensed experimental field trials were conducted at CABI, Egham in 2019. Talks with private industry have advanced and it is hoped that ultimately a product can be developed to control Japanese knotweed which would be applied in much the same way as a herbicide.

Water fern (*Azolla filiculoides*)



Azolla survived the winter relatively unscathed into 2019 leading to high early demand for the *Azolla* weevil, *Stenopelmus rufinasus*, which is mass reared at CABI. This small weevil feeds specifically on *Azolla* and in high densities can cause local eradication of the weed. Various biotic and environmental challenges slowed mass rearing, causing some shipping delays, however the majority of sites affected by *Azolla* were provided with weevils. As in recent seasons, several *Azolla* infestations were brought under effective control by naturalised populations of the weevil in regions that had recently received large weevil introductions by CABI, demonstrating the valuable underlying control exerted by this effective agent. By targeting *Azolla* outbreaks in a timely manner it is possible to limit its various economic and leisure impacts and preserve the biodiversity of freshwater ecosystems.

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Floating pennywort (*Hydrocotyle ranunculoides*)



With an ongoing embargo on export from Argentina, a race of *Listronotus elongatus* was imported from Paraguay in April 2019. Molecular and taxonomic evaluations confirm it to be conspecific to the Argentine race used for the majority of the testing. The outstanding prioritised species were subsequently tested, bringing the total of species evaluated to 76. A significant preference for the target, *H. ranunculoides*, was shown for oviposition, development and feeding compared to non-target plants. Climatic modelling suggests the weevil will be able to complete 1 to 2 generations in the southern regions of England. A new version of the Pest Risk Assessment is near completion and will be submitted to the regulators for evaluation and further peer review. If approved, further imports from Paraguay (or potentially Argentina) will be needed to facilitate intensive rearing to achieve the optimum numbers for release. Stakeholder communications and engagement continue to identify funding to support the release and monitoring phases of the project, should the weevil be approved by regulators.

Himalayan balsam (*Impatiens glandulifera*)



A strain of the Himalayan balsam rust fungus *Puccinia komarovii* var. *glanduliferae* from India, was given ministerial approval for release into the wild in the UK in July 2014. In 2015 the rust was released at 25 sites with good levels of leaf infection, but this was inconsistent between sites. Molecular analysis of UK and native range populations found that the plant has been introduced at least 3 times to the UK from different areas of its native range, and that multiple rust strains will be required to achieve fully control in the invasive range. In 2017 the UK Plant Health Officer approved the release of a new strain of the rust from Pakistan that infects a different cohort of Himalayan balsam populations. The rust has now established at some release sites; successfully overwintering with the development of good levels of leaf infection during the following growing season and natural spread of more than 50 meters. The level of rust infection achieved in the field has improved significantly following a new release protocol, the matching of weed biotypes with rust strains and support from Local Action Groups funded through the EU RAPID LIFE programme. To date, the rust has been released at 47 sites in 16 counties across England and South Wales. Although these are early days, the results are encouraging. The spread and impact of the rust will be monitored over the next few years.

Australian swamp stonecrop (*Crassula helmsii*)



Aculus sp. adults and eggs within a *Crassula* bud.

The gall-forming mite, *Aculus crassulae* (Eriophyidae) was approved as a biological control agent against *Crassula helmsii* in August 2018 following the acceptance of the Pest Risk Analysis (PRA) detailing the research conducted to date on the mite. It was reviewed by several groups including Natural England, the Scottish Government, an expert scientific panel and a public consultation. Field trials with the mite were initiated in September 2018 with the inclusion of additional sponsors from the water industry. The mite has now been released at five sites in the UK; four in England and one in Wales. At the release sites, mites were found infesting plants within and close to release plots, and the number of mite-infested plants generally increased over the course of the summer. Overwintering studies carried out during winter 2018/19 also provided evidence that *A. crassulae* can survive and develop sustainable populations under UK environmental conditions. These are encouraging results, particularly during the first full year of release. Overwintering of mites at these release sites will be assessed in spring 2020

and supplementary releases of the mites at these sites and at additional sites with subsequent monitoring will also take place in spring and summer 2020.

*Footnote: Prior to 2011, funding for this research has also been provided by the Scottish Government, predecessor bodies of the Welsh Government, Network Rail, Cornwall Council, the Regional Development Agency of South West England

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